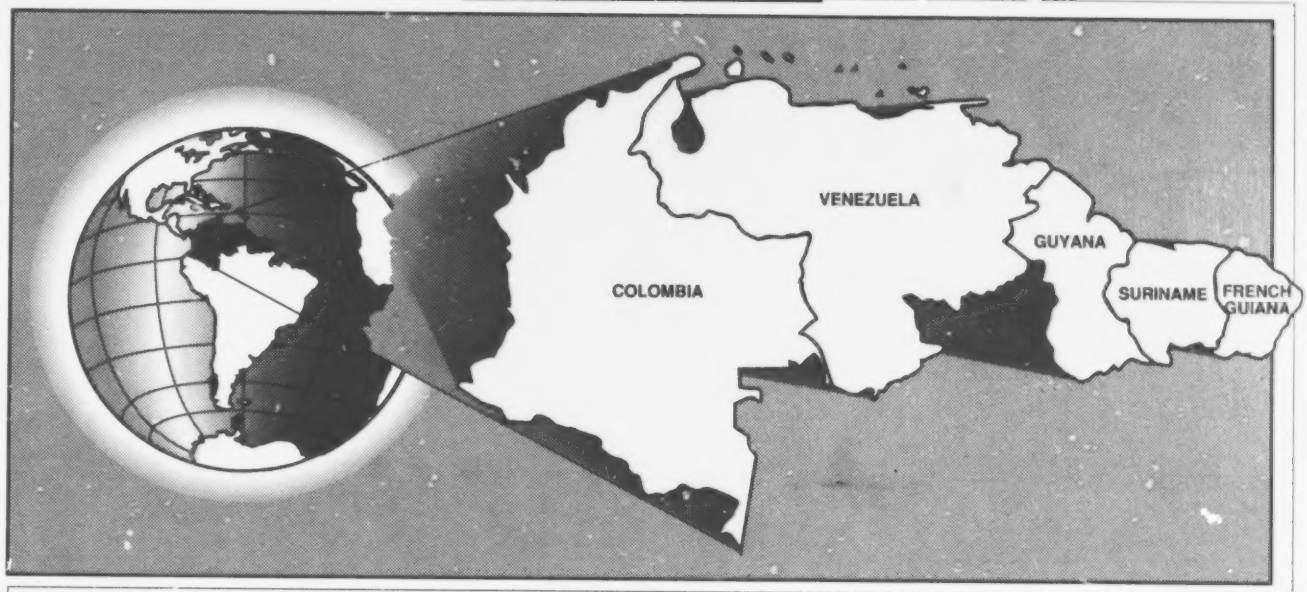
Am 35/988



THE MINERAL INDUSTRIES OF

NORTHERN SOUTH AMERICA

By Henry R. Ensminger, Alfredo C. Gurmendi, and Jerome F. Machamer

1988

INTERNATIONAL REVIEW

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

I 28.37/a 2:

READEX best copy available

THE MINERAL INDUSTRIES OF

NORTHERN SOUTH AMERICA

U.S.
DEPARTMENT
OF THE
INTERIOR

Manuel Lujan, Jr.
Secretary

BUREAU OF
MINES

T S Ary
Director

1988

Contents

Introduction 1
Colombia 1
Introduction 1
Government Policies and Programs 1
Production 2
Trade 2
Commodity Review 2
Metals 2
Gold 2
Iron and Steel 2
Lead and Zinc 2
Nickel 5
Platinum 5
Industrial Minerals 5
Mineral Fuels 5
Coal 5
Natural Gas 6
Petroleum 6
French Guiana 7
Guyana 7
Introduction 7
Commodity Review 7
Metals 7
Bauxite 7
Gold 8
Other Metals 9
Industrial Minerals 9
Mineral Fuels 9
Suriname 9
Introduction 9
Commodity Review 9
Metals 9
Alumina, Aluminum, and Bauxite 9
Gold 9
Mineral Fuels 9
Oil and Gas 9
Energy 9
Venezuela 10
Introduction 10
Government Programs 10
Production 10
Trade 10
Commodity Review 13
Metals 13
Aluminum and Bauxite 13
Gold 13
Iron Ore 13
Iron and Steel 14
Other Metals 14
Industrial Minerals 14
Cement 14
Other Industrial Minerals ... 14
Mineral Fuels 14
Coal 14
Natural Gas and Petroleum 14

Tables

Table 1.—Colombia: Production of Mineral Commodities 3
Table 2.—Colombia: Value of Mineral Exports 5
Table 3.—Colombia: Production of Gold, by Company 5
Table 4.—French Guiana, Guyana, and Suriname: Production of Mineral Commodities 8
Table 5.—Venezuela: Production of Mineral Commodities 11
Table 6.—French Guiana: Exports and Reexports of Mineral Commodities 15
Table 7.—French Guiana: Imports of Mineral Commodities 16

For further information, please contact
The Branch of Latin America and Canada
The Division of International Minerals
U.S. Bureau of Mines
2401 E St., NW, MS 5205
Washington, DC 20241-0001
Telephone: (202) 632-5060
Fax: (202) 632-0062

THE MINERAL INDUSTRIES OF

NORTHERN SOUTH AMERICA

By Henry R. Ensminger, Alfredo C. Gurmendi, and Jerome F. Machamer

INTRODUCTION[1]

In this group of four countries and a French overseas department, making up the northern part of South America, Colombia and Venezuela have the most important and most diversified mineral industries. Mineral output in both countries is dominated by the production of natural gas and petroleum. Venezuela is the second most important producer of crude oil in the Latin America region after Mexico, but Venezuela surpassed Mexico as a supplier of crude oil and petroleum products to the U.S. market. In 1988, Venezuela supplied a total of 291 million barrels to the United States compared with the supply of 273 million barrels by Mexico. Colombia, with 49 million barrels, was ranked third as a U.S. petroleum supplier and was the leading producer and exporter of steam coal in all of Latin America. Colombia also has the largest coal reserves in Latin America. Venezuela is also developing its sizable coal resources in Zulia State, which is across the border from the Colombian coal deposits.

As for nonfuel minerals, the most important commodities produced included bauxite and gold. Bauxite was produced by Guyana, Suriname, and Venezuela, but only Suriname and Venezuela have installed capacity to produce alumina and ingot aluminum. Venezuela has the bauxite reserves and enough low cost energy sources to become a significant exporter of aluminum in this decade. Some gold was produced in all five areas with Colombia as the second-ranked gold producer in Latin America after Brazil. Output of gold has been in an upward trend in Guyana and Venezuela. Colombia was the only producer of platinum. An iron and steel industry is well developed in Colombia and Venezuela, both of which had record high levels of crude steel in 1987. Output of iron ore in Venezuela was adequate to meet domestic demand and a significant level of exports. In Colombia, ferronickel exports were an important source of foreign exchange earnings after petroleum and steam coal.

Of the industrial minerals, the most important by far was cement. It was produced predominantly in Colombia and Venezuela at an equal level and with a surplus available for exports.

In terms of economic impact, the value of Colombia's mineral output was 3.6% of the country's gross domestic product (GDP) and exports of the major mineral commodities accounted for 29% of total exports. The importance of minerals in Colombia's export sector has been growing since the initiation of coal exports from El Cerrejón in early 1985 and the resumption of crude oil exports in 1986 following the discovery of important oilfields.

In the case of Venezuela, the value of petroleum output alone accounted for 13% of GDP and the leading mineral exports, including aluminum, gold, iron ore, and petroleum, represented 91% of total exports. Although Venezuela's crude oil output decreased, mining output increased 15% in 1988. Mineral commodities, particularly bauxite, are also important in the export sector of Guyana and Suriname.

COLOMBIA[2]

Introduction

Colombia's mineral production in 1988 was valued at 3.57% of the country's GDP, or approximately $1.7 billion,[3] as compared with about 3.54% of GDP in 1987 and only 1.27% of GDP in 1980. During 1988, the value of mineral production increased by 5.2% over that of 1987, down from the spectacular double-digit growth rates of the preceding 5 years, but, nevertheless, greater than the 4.2% growth rate of the economy as a whole. The principal mineral products were petroleum, coal, and gold, in that order. The rapid growth in the value of mineral production that occurred in the mid-1980's was due to the wave of new production from the Caño Limón oilfield of northeastern Colombia and the Cerrejón Norte coal mine in the Guajira Peninsula; the reduced growth evident in 1988 reflects the stabilizing of production from those two areas.

The value of mineral exports in 1988 was $1.7 billion, or more than 29% of the total value of all exports. The fact that total mineral exports were assigned a greater value than total mineral production suggests that the value assigned to crude oil refined in Colombia and the prices for refined products sold in Colombia were both less than the value of comparable products in world markets, whereas exported materials were valued at world price levels. Principal mineral exports during 1988, in order of decreasing value, were: crude oil and refined petroleum products, coal, ferronickel, and emeralds. The total value of mineral production is not broken down by specific mineral commodities; however, all of the foregoing commodities are heavily export oriented, and the rank and value of exports approximates that of overall production, excluding gold. An exception to this generalization is cement, of which more than 80% was consumed internally. Cement exports were valued at $66 million. The total indicated value of cement production was about $300 million, putting cement in fourth place in importance in Colombia's mineral production.

On a monetary basis, the most important factors affecting the performance of the mineral industry in 1988 were decreased oil production and lower prices for exported crude oil and refined products. This was offset to some extent by increased coal production and exports and by substantial increases in the price received for nickel.

Government Policies and Programs

Regulatory legislation of significance to future mineral production included the passage of a new Mining Code

(Código Minero), which was expected to come into effect late in 1989, and the beginning of a program to promote and encourage the further development of Colombia's large steam coal resources. The new mining act, which was designed to facilitate and encourage mineral exploration and development, particularly on the part of small- and medium-scale miners, contains provisions to facilitate and expedite the processing of claim applications, to improve the security of mineral occupancy and tenure, and to establish a fund to provide financial assistance to small- and medium-scale miners.

Several basins that contain Early Tertiary coals similar to those of the Cerrejón deposit occur in northern Colombia. One of these deposits, La Loma, in the Department of César, has been leased to Drummond Coal Co. of Birmingham, Alabama, and is scheduled to begin production by 1993. Feasibility studies regarding the development of other deposits were underway; the Government hopes to increase annual coal production to the level of 60 million tons per year by the end of the century.

Another project with major potential for the future of Colombia is the Guainía project in eastern Colombia. This project was established in 1987, as a venture between Empresa Colombiana de Petróleos (ECOPETROL) and Empresa Colombiana de Minas (ECOMINAS), to carry out a preliminary geological assessment of alluvial and bedrock gold occurrences in the Precambrian terrane of the Serranía de Naquén. Widespread indications of gold mineralization have reportedly been located. The Government was reported to be drawing up an invitation to qualified companies with expertise in large-scale gold mining to submit proposals for further exploration and evaluation of the area.

Production

Reported mineral production generally increased in 1988, with record production levels achieved in important commodities such as crude steel, cement, and coal. Production increases also were recorded for gold, platinum, and silver, and for several industrial minerals, including salt and sulfur. On the other hand, production of crude oil and natural gas declined, largely as a result of terrorist attacks against pipelines and pipeline stations. Terrorist activities in gold mining areas, late in the year, threatened to cause a major disruption in production of that commodity.

Trade

Exports of mineral products from Colombia in 1988, including refined petroleum products, were valued at $2.02 billion and were 38% of total exports. This was a decline of 7% from 1987, when mineral exports were valued at $2.17 billion and were 41% of total exports. The decline was due entirely to the decrease in volume and realized price for crude oil and refined petroleum products. With the exception of cement exports, which declined marginally in both volume and value, the value of all other mineral exports increased. Summary data on the value of mineral exports are shown in table 2.

Commodity Review

Metals.—**Gold.**—Gold production in 1988 increased by 9% over that of 1987, as a result of the relatively high prices for bullion that prevailed in the early part of the year and of increased artisanal activity in eastern Guainía Province. The principal gold-producing area is in the Department of Antioquía, where gold is recovered from both lode and placer deposits. Although the bulk of the gold is produced from artisanal placer workings, large-scale dredging operations are conducted by Mineros de Antioquía S.A. in the Río Nechi, and vein-type deposits are worked by Frontino Gold Mines Ltd. near Segovia. Gold is also recovered as a byproduct from alluvial platinum deposits in the Department of Chocó. Greenstone Resources Ltd. of Canada continued its exploration of the Oronorte lode deposits in the Segovia area. Data on gold production are shown in table 3.

A major gold exploration and evaluation program was carried out in the Caranacoa and Serranía de Naquén regions in the Department of Guainía in easternmost Colombia. Occurrences of placer gold in Pleistocene and Recent river sediments are widespread; bedrock occurrences in conglomerates and quartzites of the Precambrian Guainía formation also have been reported. Exploration work was conducted by Proyecto Minero del Guainía, a venture sponsored jointly by ECOMINAS and ECOPETROL. The most prospective area for major gold concentrations has been set aside as a national reserve, and an invitation to submit proposals for further exploration and development was expected in 1989.

Iron and Steel.—Colombia's only integrated steel producer, and largest private employer, Acerías Paz del Río, operates iron ore mines at Paz de Río and an integrated steelworks at Belencito, both in Department of Boyacá northeast of Bogotá. Acerías Paz del Río shipped about 260,000 tons of rolled steel products in 1988, accounting for more than 40% of steel shipments from Colombian mills. Nonintegrated steel producers, all of which produce steel in electric furnaces from scrap or pig iron, include Siderúrgica de Medellín S.A. and Hojalata y Laminados S.A. in Medellín; Siderúrgica del Pacífico S.A. in Cali; and Siderúrgica del Boyacá S.A. in Bogotá. Domestic capacity was effectively fully utilized, and several of the nonintegrated producers announced major expansion plans. Total demand for finished steel products in 1988 was about 1.1 million tons, of which 454,000 tons was imported.

Lead and Zinc.—Minor quantities of lead and zinc concentrates were pro-

TABLE 1

COLOMBIA: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1984	1985	1986	1987[p]	1988[p]
METALS						
Aluminum, bauxite		560	—	—	—	—
Copper, mine output, Cu content		234	—	—	—	—
Gold	troy ounces	730,670	1,142,385	1,285,878	853,468	932,824
Iron and steel:						
Iron ore and concentrate	thousand tons	441	439	523	615	615
Pig iron	do.	271	246	319	r326	309
Ferroalloys: Ferrosilicon		(2)	(2)	(2)	(2)	—
Steel, crude	thousand tons	r507	r530	631	689	754
Semimanufactures, hot-rolled	do.	r385	r431	457	532	597
Lead:						
Mine output, Pb content		51	82	202	158	31
Refined (secondary)[e]		3,000	3,000	4,000	4,000	4,000
Nickel:						
Mine output, Ni content		21,885	15,434	e22,600	e25,200	19,979
Ferronickel, Ni content		17,064	11,800	e18,600	e20,700	16,669
Platinum-group metals	troy ounces	10,106	11,650	14,368	20,528	26,200
Silver	do.	153,445	168,770	187,188	160,277	210,955
Zinc, mine output, Zn content		—	2,000	6,000	—	138
INDUSTRIAL MINERALS						
Asbestos		9,982	12,435	e13,000	e13,000	16,819
Barite		3,340	5,050	4,198	3,792	e4,000
Cement, hydraulic	thousand tons	5,215	5,394	6,011	5,965	e6,378
Clays: Kaolin		938,307	1,041,151	1,155,267	1,221,000	1,306,470
Diatomite[e]		(2)	(2)	(2)	(2)	—
Feldspar		32,000	34,308	35,722	33,760	e35,000
Gypsum	thousand tons	260	250	295	302	307
Lime, hydrated and quicklime[e]	do.	1,300	1,300	1,300	1,300	1,300
Magnesite[e]		1,600	1,600	[3]14,936	15,000	16,000
Nitrogen: N content of ammonia		93,700	99,400	93,440	88,900	84,300
Phosphate rock		11,480	24,249	28,626	e34,000	e29,800
Precious and semiprecious stones: Emerald[4]	carats	394,181	337,950	634,561	886,551	1,095,650
Salt:						
Rock	thousand tons	271	236	227	205	209
Marine	do.	664	494	501	450	473
Total	**do.**	**935**	**730**	**728**	**655**	**682**
Sodium compounds, n.e.s.: Sodium carbonate		129,440	113,209	112,920	116,864	114,087
Stone and sand:						
Calcite		4,575	3,107	5,334	5,334	e8,736
Dolomite	thousand tons	15	15	14	33	33
Limestone	do.	11,565	11,756	e12,000	e12,000	11,980
Marble		15,171	16,993	19,568	17,500	e17,500

See footnotes at end of table.

TABLE 1—Continued

COLOMBIA: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1984	1985	1986	1987[p]	1988[p]
INDUSTRIAL MINERALS—Continued						
Stone and sand—Continued						
Sand excluding metal-bearing		521,578	511,587	516,215	602,400	654,800
Sulfur:						
Native (from ore)		36,245	41,374	36,038	41,490	42,795
Byproduct, from petroleum		10,430	9,790	[e]10,000	[r e]10,200	8,200
Total		**46,675**	**51,164**	**[e]46,038**	**51,690**	**50,995**
Talc, soapstone, pyrophyllite		6,785	8,611	9,013	11,927	12,800
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]		18,000	18,000	18,000	18,000	18,000
Coal:						
Metallurgical	thousand tons	603	618	630	759	585
Steam	do.	6,034	9,088	11,540	13,835	14,315
Total	**do.**	**6,637**	**9,706**	**12,170**	**14,594**	**14,900**
Coke, all types[e]	do.	550	550	550	600	550
Gas, natural:						
Gross	million cubic feet	182,100	182,700	[e]185,000	[e]190,000	177,573
Marketed	do.	([5])	([5])	([5])	([5])	143,445
Natural Gas Liquids	thousand 42-gallon barrels	[r]2,320	[r]2,297	2,216	1,717	1,384
Petroleum:						
Crude	do.	61,153	64,352	110,714	147,843	136,760
Refinery products:						
Gasoline:						
Aviation	do.	317	342	313	276	255
Motor	do.	22,916	21,432	24,589	28,603	27,281
Jet fuel	do.	3,487	3,651	3,829	3,888	3,685
Kerosene	do.	2,017	2,156	2,147	2,054	2,198
Distillate fuel oil	do.	10,507	11,150	11,152	14,502	14,080
Residual fuel oil	do.	20,027	19,825	21,017	23,776	23,319
Lubricants[e]	do.	657	657	730	750	733
Liquefied petroleum gas (propane)	do.	3,641	3,702	2,782	3,445	4,569
Asphalt and bitumen	do.	967	926	973	1,079	1,127
Refinery fuel and losses and unspecified products	do.	1,208	1,029	1,915	[e]1,986	3,779
Total	**do.**	**65,744**	**64,870**	**69,447**	**80,359**	**81,026**

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Table includes data available through Nov. 1989.

[2] Revised to zero.

[3] Reported figure.

[4] Based on registered exports by the Banco de la Republica.

[5] Comparable historical data were not available at the time of publication.

TABLE 2

COLOMBIA: VALUE OF MINERAL EXPORTS

(Millions of U.S. Dollars)

	1984	1985	1986	1987	1988[e]
Crude Oil and Refined Products	$455.0	$409.0	$619.0	$1,341.0	$952.7
Coal	37.8	124.8	190.4	359.6	424.5
Ferronickel	62.4	54.6	48.0	77.1	179.4
Emeralds	21.0	27.0	34.0	62.0	89.8
Cement	18.4	22.7	25.3	62.8	65.7
Total	**$594.6**	**$638.1**	**$916.7**	**$1,902.5**	**$1,712.1**
Total Exports	**$3,623**	**$3,782**	**$5,434**	**$5,638**	**$5,805**
Minerals as percent of total	16%	17%	17%	34%	29%

[e] Estimated.

duced by Frontino Gold Mines from its gold mining operations at Segovia, Department of Antioquía. Reported production in 1988 was 255 tons of lead concentrates containing 12% lead and 383 tons of zinc concentrates containing 36% zinc.

Nickel.—Colombian nickel production is in the form of ferronickel produced by Cerro Matoso S.A. from a nickeliferous laterite deposit at Monte Líbano, southeast of Montería in the Department of Córdoba. Ferronickel production in 1988 was 41,672 tons containing about 16,600 tons of nickel, a decrease of about 15% from 1987. Export earnings from ferronickel, however, increased from about $77 million in 1987 to $179 million in 1988, reflecting the much higher prices for nickel that prevailed during 1988. During the year, the company rescheduled its foreign bank debt of $262 million. Production was expected to decrease again in 1989 because of a planned shutdown for maintenance.

TABLE 3

COLOMBIA: PRODUCTION OF GOLD, BY COMPANY

(Thousand troy ounces)

Company	1988	Percent of total
Frontino Gold Mines Ltd.	45.9	4.9
Mineros de Antioquia S.A.	41.2	4.4
Cía. Mineros de Chocó	2.8	0.3
Small and Medium Producers	842.9	90.4
Total	**932.8**	**100.0**

Platinum.—Production of platinum group metals (PGM) in 1988 increased by 28% over 1987, probably in response to rising prices for those metals. Although Colombian production of PGM was minute on a global scale, the country was, nevertheless, the fifth most important primary source of PGM in the world. Production is derived entirely from placer deposits along the Río San Juan in the Department of Chocó. The source area for the placer deposits has not been identified.

Industrial Minerals.—Colombia is a producer of several industrial minerals, including asbestos, barite, cement, feldspar, gypsum, kaolin and other clays, lime, limestone and dolomite, magnesite, phosphate, salt, sodium carbonate, sulfur, and talc. Notable production increases were recorded for cement, emeralds, and talc. Cement production increased by 7% over that of 1987. Cement exports declined marginally but still exceeded one million tons or 15% of total production; export revenues from cement were $66 million. Reported emerald production and the value of emerald exports increased by 21% and 50%, respectively, over those of 1987; these compare with increases of 76% in volume and value from 1986 to 1987 and were a result of the Government's efforts to institutionalize and regularize the trade in emeralds. Nitrogen production declined for the fourth year in a row, and phosphate rock production declined by 12% from the record level achieved in 1987; reasons for these declines were not known.

***Mineral Fuels.*—Coal.**—Coal production in Colombia increased by about 1.3 million tons or 9% in 1988 as compared to 1987. The most important mine is Cerrejón Norte, on the Guajira Peninsula. The mine, which is operated on a 50–50 joint venture basis by Carbones de Colombia S.A. (CARBOCOL), a State-owned corporation, and International Colombia Resources Corp. (INTERCOR), a subsidiary of Exxon Corp., produced about 9.6 million tons and shipped about 9.4 million tons in 1988. Production fell short of the 10.5-million-ton objective set for the year but nevertheless was 10% more than production in 1987. Nominal capacity of the Cerrejón Norte mine complex is 15 million tons per year. The price, f.o.b. port for spot sales of Cerrejón coal, increased by $10 per ton to $37 per ton; because of contract sales, however, the average price received for coal shipped was only $29.06 per ton. Gross revenue for the venture was $275 million on shipments of 9.36 million tons. During 1988, coal was shipped from Cerrejón Norte to more than 20 countries; Denmark, the Netherlands, and the United States were the three most important destinations.

CARBOCOL reopened the Cerrejón Centro Mine in mid-1988 with the objective of shipping 500,000 tons of coal using the Cerrejón Norte rail and port facilities. The mine was being operated by Pinski y Associates under contract

to CARBOCOL. In 1988, production was reported to have been 60,000 tons.

Colombia was developing ambitious plans to become the world's largest coal exporting country. Three major coal developments were announced during the year, all involving coals in the La Loma-La Jagua syncline in the Department of César, about 200 kilometers southwest of the Cerrejón area. Coals in the La Loma-La Jagua Basin are similar to those at Cerrejón. Drummond Coal Co. of Birmingham, Alabama, entered into a 30-year agreement with CARBOCOL under which Drummond will develop and operate the La Loma deposit. Coal may be transported down the Río Magdalena by barge for shipment through either the Port of Cartagena or the Port of Barranquilla, or the railroad line to the Port of Santa Marta may be upgraded to enable the coal to be shipped through that port. Production rate may be as high as 6 million tons per year. Feasibility studies were initiated for two other projects in the same basin, El Descanso and La Jagua, each involving proposed production in the range of 3 to 5 million tons per year.

Other coal projects being studied included development of the Alto San Jorge coal basin in the Department of Córdoba and of metallurgical coal and anthracite in the Department of Norte de Santander. The Government entered into discussions with Mexico and Brazil, among other countries, to supply both steam and metallurgical coal, and continued its marketing efforts with respect to the Cerrejón coals. The country hopes to raise coal production to 60 million tons of coal annually by the year 2000.

Natural Gas.—Natural gas production in 1988 was 487.5 million cubic feet per day on a gross basis or 393 million cubic feet per day on a marketed basis, equivalent to marketable production of 143.4 billion cubic feet for the year. Production was essentially unchanged from 1987. Principal producing fields were the offshore Chuchupa Field and the onshore Ballena Field, both in the Guajira Peninsula area, and the Payoa and Provincia Fields in the Middle Magdalena River valley. A new State-owned corporation, Sociedad de Gas Natural, was established to distribute and sell natural gas throughout Colombia. Gas is currently distributed along the north coast of Colombia by pipeline. A new line from gasfields in the Meta River Basin to Villavicencio and Bogotá was nearing completion, and new pipelines to augment gas distribution along the north coast and to bring additional gas into the central part of the country were being planned. Measured reserves of natural gas stood at 4,360 billion cubic feet at yearend.

Petroleum.—Colombia is an important oil producing country, ranking seventh in the Western Hemisphere in terms of crude oil production and about eighth in terms of refining capacity. There are three major producing areas in the country: a belt along the eastern foothills of the Andes Mountains, which generally parallels and lies to the north of the Río Meta (part of the Orinoco drainage); an area around Barrancabermeja in the middle part of the Magdalena River Basin, which appears to be at the head of the ancestral delta of the Río Magdalena; and an area around Tibú in the northern portion of the Department of Norte de Santander, which extends into Venezuela and is part of the Maracaibo Basin. Lesser fields have been found along the upper course of the Río Magdalena and bordering the Río Putumayo in southern Colombia; this latter area extends into Ecuador and is also on the eastern flank of the Andes chain. A few oil and natural gasfields are found in the delta of the Río Magdalena, but the main sources of gas are the Chuchupa and Ballena Fields.

Major refineries in Colombia are located at Barrancabermeja, in the center of the country, and at Cartagena, on the Caribbean coastline, with capacities of 150,000 and 70,000 barrels per day (bbl/d), respectively. Smaller refineries to service local needs are located at Tibú; at El Guamo, southwest of Bogotá; and at Mocoa in southern Colombia. Crude oil loading facilities are located at Coveñas on the Caribbean Sea and at Tumaco in southern Colombia on the Pacific Ocean. Petroleum products are shipped through Buenaventura on the Pacific Coast and, probably, through Cartagena on the Caribbean.

Crude oil production in 1988 declined from 385,000 bbl/d in 1987 to 373,000 bbl/d in 1988, largely as a result of interruptions to production while damages to crude oil pipelines, caused by terrorist attacks, were being repaired. Of total production, 80,700 bbl/d or 22% was from fields operated by ECOPETROL; 59,880 bbl/d or 16% was produced by private sector companies; and the remaining 232,500 bbl/d were produced from fields operated jointly by ECOPETROL and private firms. The major oilfield in Colombia is the Caño Limón Field, near the Venezuelan frontier in the Department of Arauca. The field was discovered by Occidental Petroleum in 1983 and is operated by a consortium including Occidental, Shell International, and ECOPETROL. Production in 1988 was 182,875 bbl/d, or 49% of total Colombian crude oil production. A major project during the year was the completion of a power generation and distribution system to service the oil production and transportation facilities as well as the municipalities in the region.

A number of pipeline projects designed to increase production and export capacity to 620,000 and 360,000 bbl/d, respectively, were planned or underway. These included lines that will link the Upper Magdalena region, southwest of Bogotá, and the East Plains region, east of Bogotá along the Río Meta, with the main crude oil export system, as well as additional

pipeline capacity for the oil from the Caño Limón area. During the year, the Porvenir-Velásquez segment of the East Plains line was completed, linking the fields of the Meta River Basin to the national system and the major refinery at Barrancabermeja.

The major refinery in Colombia, which is in the center of the country at Barrancabermeja, in the Department of Santander, had a capacity to process 150,000 bbl/d of crude oil. The other large refinery, which is at Cartagena, Department of Bolívar, had a capacity to process 70,000 bbl/d. Small refineries are at Tibú, Department of Norte de Santander; El Guamo, Department of Tolima; and at Orito, Department of Putumayo. The two large refineries operated near capacity in 1988, processing a total of 214,100 bbl/d of crude, while the three small refineries processed a total of 3,700 bbl/d. Total refinery throughput of 217,900 bbl/d was down 3% from the record level of 224,300 bbl/d achieved in 1987.

Crude oil exports in 1988 were 138,000 bbl/d or 37% of total production, a decrease of 5% from the 146,000 bbl/d export rate in 1987. Average price per barrel declined from $17.70 in 1987 to $13.50 in 1988, resulting in decline in the value of crude oil exports, from approximately $943 million in 1987 to approximately $680 million in 1988. Exports of refined petroleum products decreased in indicated value from $398 million in 1987 to $273 million in 1988, while gasoline imports increased in value from $101 million to $139 million. The net trade balance in refined petroleum products therefore decreased from $297 million in 1987 to $134 million in 1988.

The Government continued its policy of encouraging active and aggressive exploration and development of the nation's petroleum resources. Twenty-eight new association contracts or joint exploration agreements between ECOPETROL and private groups were signed during the year, including two contracts covering about 2.5 million hectares off the Pacific coast. Eighty-seven exploration wells with an aggregate length of 550,000 feet were drilled during the year; 23 of these wells were drilled by ECOPETROL, and 33 were reported as having positive results. In addition, 204 development wells were drilled, of which 109 were drilled by ECOPETROL, and 176 were described as positive. Proven reserves of crude oil were reported to be 1.9 billion barrels at December 31, 1988; 45% of these reserves are in the Cravo Norte area of the Department of Arauca, which includes the Caño Limón Field. Of the total proven reserve, ECOPETROL holds sole interest in 23% and, through association contracts, has interests in another 69%.

FRENCH GUIANA[4]

French Guiana's limited mining industry produced columbite-tantalite, gold, sand and gravel, and stone. However, mining continued to represent a small sector of the country's economy.

GUYANA[5]

Introduction

Guyana reported that economic performance in 1988 did not considerably differ from 1987 when a growth rate of 3% in GDP was recorded. Policies formulated to attract foreign investment in the mining sector seem to be paying off. Several companies started gold exploration and the Guyana Geology and Mines Commission (GMC), the agency authorized to negotiate agreements, held discussions with U.S., Canadian, and European firms. The Government acknowledged the need for foreign investment and technology to create a viable mining industry. Guyana reviewed its mining code to attract new foreign investment and no longer insists on equity participation in mining projects except where prior exploration had taken place.

Foreign mining companies are exploring for oxide deposits and placers. Bauxite, gold, and diamonds are extensively explored. Kaolin, feldspar, sand, clays, and shells are also actively explored.

Guyana's gold rush of 1987–88 was prompted by new governmental policies that are reflected in the revised mining and foreign investment codes.

Commodity Review

Metals.—**Bauxite.**—Bauxite is the most valuable mineral resource in Guyana. The Government-owned Guyana Mining Enterprise Ltd. (Guymine) produces high-grade bauxite ores at Linden, Ituni, and Kwakwani with proven reserves of 100 million tons. In 1988, mine production was about 1.9 million tons of ore. Guyana supplanted Jamaica as Canada's largest supplier of bauxite. The United States accounted for more than 25% of Guyana's bauxite exports, followed by Canada with 13%, Norway with 11%, and the Federal Republic of Germany with 5%.

The Guyana Government entered into a joint venture with Reynolds Metals Co. of the United States on a 50–50 basis to develop a new bauxite mine with a potential annual capacity of 2.6 million tons at Aroima in the Barbice River. Production was expected to start by late 1989 at this property.

Guyana's Bauxite Industry Development Corp. (Bidco) was planning to conduct a feasibility study to reopen the 300,000 tons per year refinery, which closed in 1982, at Linden. Bauxite feed was to come from the Ituni Mine in eastern Guyana.

Guymine agreed to supply 1.1 million tons of bauxite for 3 years to Interalumina of Venezuela. Bidco contracted the Venezuelan company Dayco S.A. to open a bauxite mine in Kwakwani in eastern Guyana. Output will be processed at Everton, Guymine's plant, prior to being shipped to Interalumina.

TABLE 4

FRENCH GUIANA, GUYANA, AND SURINAME: PRODUCTION OF MINERAL COMMODITIES[1]

Country and Commodity		1984	1985	1986	1987[p]	1988[e]
FRENCH GUIANA[2]						
Gold, mine output, Au content	troy ounces	10,127	8,005	10,481	11,000	11,000
Stone, sand and gravel[e]	metric tons	400,000	400,000	400,000	400,000	400,000
GUYANA[2]						
Aluminum:						
Bauxite, dry equivalent, gross weight	thousand metric tons	1,333	1,675	1,466	[3]2,200	[3]1,339
Diamond[e]:						
Gem	thousand carats	6	4	3	2	3
Industrial stones	do.	8	7	6	5	6
Total	**do.**	**14**	**11**	**[3]9**	**7**	**9**
Gold, mine output, Au content	troy ounces	11,131	10,323	14,035	[3]50,425	75,000
SURINAME[2]						
Aluminum:						
Bauxite, gross weight	thousand metric tons	3,454	3,000	3,847	1,200	2,000
Alumina	do.	1,208	1,000	1,471	1,370	1,400
Metal, primary[4]	do.	[r]29	29	30	29	30
Cement, hydraulic	do.	50	50	50	50	50
Clays: Common[e]	metric tons	100,000	100,000	110,000	110,000	110,000
Gold, mine output, Au content	troy ounces	322	500	600	[e]700	700
Sand and gravel[e]:						
Sand, common	thousand metric tons	150	155	160	160	160
Gravel	do.	20	25	25	25	25
Stone, crushed and broken	do.	46	[e]50	50	[e]50	50

[e] Estimated [p] Preliminary [r] Revised

[1] Includes data available through mid-June 1989.

[2] In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) undoubtedly were also produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Data represent exports.

Gold.—Paranapanema S.A. of Brazil announced a production decision at the Tassawini property, about 110 kilometers northwest of Georgetown. The proven and probable ore reserves were expected to be in excess of 3 million tons grading 2.4 grams of gold per ton. Tentative production target was set at 25,000 troy ounces or 780 kilograms per year.

The Main Stock Zone of the Omai project, 120 kilometers south of Georgetown, was reported to contain, at yearend, minable reserves of 30.4 million tons grading 1.53 grams of gold per ton or 1.5 million troy ounces of gold. The joint venture of Placer Dome Inc. and Golden Star Resources Ltd., both Canadian firms, requested a 6-month extension of the original April 1989 feasibility deadline to evaluate additional drilling at the discovery at Wenot Lake, south of the Omai project. Golden Star Resources Ltd. is dedicating mining concessions efforts in the Potaro District. The Proto-Mahdia gravels contain a demonstrated 12 million cubic meters and a possible 32 million cubic meters of workable dry gravels, averaging near 0.4 gram of gold per ton. Homestake Co. of the United States and its partner, South American Goldfields Inc. of Toronto, Canada, commenced drilling at Peter Mine and the Tiger River and Dazier Creek properties in the Potaro District.

Denison Mines Ltd. of Canada signed concession agreements with the Government in October to explore jointly with its partner South American Goldfields Inc., in the Cuyuni and Mozaruni areas. The Aurora Mine, 200 kilometers west of Georgetown, produced more than 60,000 troy ounces of gold in the 1940–50 period from veins

grading 0.5 to 1 ounce of gold per ton, from a small open pit in stockworked porphyry, and from the Quartz Hill property immediately west of Placer's Omai deposit.

Guyana is seeking partners to fund drilling of promising gold prospects, such as the Marudi Mountain property in the far south of Guayana, Kaburi, and the Bishop properties in the Potaro District.

Other Metals.—Small copper mineralization and occurrences are scattered over the northern half of Guyana. The most important occurrence is the Groete Creek prospect. Molybdenite occurrences also are present in the Potaro District, principally at the Eagle Mountain near the Mahdia goldfield.

Diamonds are associated with the Pakaraima Mountain formation in the west of the country. Most of the diamond-bearing areas are on the right bank of the Middle Mazaruni River. Several thousand carats of diamonds were exported annually. Diamond production decreased from more than 9,000 carats in 1986 to about 7,000 carats in 1987; no detailed information was available for the 1988 output.

Industrial Minerals.—Kaolin occurrences are coincident with bauxite. Guyana has large and widespread resources of kaolin and ball clay. Guyana was planning to install a kaolin milling plant to process the high quality Topaira deposit at Ituni, which has an estimated reserves of 3 million tons. Over 5,000 square miles of northeastern Guyana is covered with white sand suitable for glass manufacturing.

***Mineral Fuels.*—Oil and Gas.**—Guyana carried out prospecting for both mineral fuels on the Continental Shelf with only minimal success to date. The Takutu Basin, about 300 miles south-southwest of Georgetown is the only inland prospect. This basin is considered petroliferous because one of two exploratory wells by Home Oil Co. discovered crude of 42° API, which flow tested at 500 bbl/d.

SURINAME[6]

Introduction

Suriname's economy revolved around the bauxite industry. The mining and processing of bauxite into alumina and aluminum ingot accounted for 8% of the GDP and 70% of exports. Suriname was the third largest bauxite producer in the Latin American region after Brazil and Jamaica. Suriname was the fifth most important International Bauxite Association member country bauxite producer, accounting for about 3.5% of world output. Production of bauxite amounted to almost 3.4 million tons, an increase of 31% more than the previous year.

The Suriname Government drafted a revised mining code in order to attract new foreign investment.

Commodity Review

***Metals.*—Alumina, Aluminum, and Bauxite.**—Bauxite is mined by Suriname Aluminum Co. (Suralco), a subsidiary of the Aluminum Co. of America (Alcoa) and NV Billiton Maatschappij Suriname (Billiton), a Royal Dutch/Shell Group Subsidiary. Both companies experienced considerable setbacks as a result of guerrilla activities, strikes, and wage disputes. The rate of exchange received by the mining industry hindered investment. Billiton and Suralco were seeking concessions from the Government on reducing export levies as a precondition for investment to include new bauxite mines at Moengo, Accaribo, and Onoribo. Suralco is also committed to develop the kaolin deposits at Moengo.

Alumina production increased by almost 20% to about 1.6 million tons. Aluminum output increased to 5,300 tons following the reopening of the Paranam smelter and refinery complex at only 50% capacity because of guerrilla activity and the low level of water in the Brokopondo reservoir. Alumina and aluminum were produced by the joint venture of Suralco and Billiton.

Suriname's bauxite reserves occur in the Backnays Mountains in the southwest area of the country and were estimated at 490 million tons.

Gold.—Alluvial and primary gold mineralization are typical occurrences in Suriname. Placers are worked at Tibiti River, Litanie River, Platina Creek, Pete Creek, and Rosebel prospect. It was reported that the state mining company, Grassalco, has proven reserves of 5 million tons grading 2 grams of gold per ton at its Gross-Rosebel gold prospect in southeastern Suriname.

***Mineral Fuels.*—Oil and Gas.**—Production of oil in Suriname came from the Tambaredjo and Borneo fields east of Paramaribo where reserves are estimated at 200 million barrels. The Government oil firm, Staatsolie, reported a new oil find in the Saramacca District west of Paramaribo where reserves are estimated at 350 million barrels.

Suriname's oil production rose as a result of increased drilling and steam injection reaching a level of about 730,000 barrels by yearend. The target for 1990 was expected to be 5,000 bbl/d.

Surveys for other possible oil and natural gas deposits were underway. Staatsolie announced in October 1988 a $35 million[7] refinery to produce diesel oil and propane gas, with construction to begin in 1989. Production was expected to increase to 3,000 bbl/d.

Energy.—Suriname's energy sector is closely linked to the bauxite industry with installed capacity of about 450 megawatts composed of 54% thermal and 46% hydroelectric. Staatsolie was planning a $56 million, 12-megawatt power station in the Saramacca District in conjunction with the Suriname Electricity Co. The facility was expected to reduce by 33% Suralco's supply of

power to the national grid. Completion of this project was set for 1990.

VENEZUELA[8]

Introduction

Venezuela's economy did well in 1988 with the GDP reaching $48.8 billion[9] in terms of current prices. This represented a real growth of 4.2% versus the 3.2% growth of 1987. The mining sector grew 14.6% (due to higher gold production), while oil improved by only 1% and agriculture and construction increased by 4.2% and 6.2%, respectively. Inflation recorded a record 6.8% increase in December and reached a total of 35.5% for the year. The 1988 inflation rate was the second highest in recent history, only trailing the 40.3% increase posted in 1987.

Since 1987, Japan had become the major source of financing in Venezuela. In 1988, the Export-Import Bank of Japan provided more than $400 million for the modernization of a bauxite mine and for the construction of a new hydroelectric complex. Mitsubishi Metal Corp., part of the Japanese consortium holding 20% of Industria Venezolana de Aluminio C.A. (VENALUM), agreed to finance part of an expansion program in the state aluminum industry. In April, the President visited Japan in an endeavor to secure loans from the Export-Import Bank for investments in projects ranging from aluminum and steel production to railway improvements, hydroelectric power, and petrochemicals.

Siderúrgica Venezolana S.A. (SIVENSA), an industrial holding company comprised of 40 companies, reported sales of $610 million up 25% from that of 1987. SIVENSA was the sixth largest company in Venezuela in 1988 and the largest private sector group in the steel sector. Its direct iron ore briquette reduction plant at Puerto Ordaz, Bolívar State, came on-stream at yearend.

CORIMON, a 26 company private sector conglomerate, announced its sales increased 84% in 1988 to $340 million. The group announced that it had planned investments of about $210 million concentrated on projects in the petrochemical sector. Among the planned projects was one with Petroquímica de Venezuela S.A. (PEQUIVEN), a subsidiary of Petróleos de Venezuela S.A. (PDVSA), to produce ethylene oxide, which was projected to save the country $40 million in imports, annually, when production begins in 1991.

Government Programs

State investment in industry development in Venezuela had concentrated particularly in the eastern Guayana region. While the oil industry had declined in recent years, the Guayana Project had played an increasingly dominant role in the country's economic development policy. A large part of the project had come under the aegis of the Corporación Venezolana de Guayana (CVG), the Guayana Development Corp.

Central to CVG's activities had been the project's aim to improve and initiate international trade, based upon development of Venezuela's natural resources in addition to stimulating downstream processing activities. While the oil boom in the early 1970's was responsible for considerable initial project investment, the sudden decline in oil income in the 1980's further encouraged this development in order to establish diverse income earnings as an alternative to an oil-based industry.

Production

Estimated aluminum production exceeded the figure for 1987 by approximately 6%. Planned production by 1992 is expected to be near 850,000 tons annually with projected annual production of 2 million tons by the year 2000. Production of alumina is expected to increase to 4 million tons annually by the year 2000. Plans were formulated to increase bauxite production to 6 million tons annually by the mid-1990's and to at least 8 million tons by the year 2000.

Coal production showed a dramatic increase in 1988, increasing approximately 900% over that of 1987 according to Carbones del Guasare S.A. Projected production figures for the mid-1990's are to attain or exceed 6.5 million tons annually. The great majority of the coal will be produced by the Guasare coal project in the State of Zulia, 100 kilometers northwest of Maracaibo.

The production of iron ore by C.V.G. Ferrominera Orinoco C.A. (FERROMINERA) increased by approximately 6% in 1988. Ferrominera began an expansion of its processing and storage facilities to meet increased demands of customers for high grade ore. It has scheduled an increase from its production capacity of 18 million tons in 1988 to 25 million tons in 1992.

Total crude petroleum production, including lease condensate and gas liquids, decreased approximately 4% in 1988. The lower production combined with the lower price for crude petroleum resulted in a decrease of revenue by approximately 7% to $7.1 billion.

Raw steel production decreased by 1.2% in 1988 while sponge and pig iron production was down by about 2%. Hot-rolled steel products declined by almost 3%. C.V.G. Siderúrgica del Orinoco C.A. (SIDOR), the state steel company, produced approximately 83% of the total steel production while SIVENSA, an independent producer, accounted for the remainder.

Trade

Venezuela's total exports decreased $2.35 billion below the figure for 1987. This resulted in a negative trade balance of $515 million compared to a positive trade balance of $2.27 billion for the previous year. The major contributor to the decline in the trade balance was petroleum exports, which was $702 million below the figure for 1987. The export values of aluminum, iron ore, and steel were up 22%, 39%, and 21%, respectively, for a total increase of $157 million.

Venezuela and Cuba were finalizing a

TABLE 5

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1984	1985	1986	1987[p]	1988[e]
METALS						
Aluminum:						
Alumina		1,139,000	1,085,000	1,296,000	[e]1,347,000	350,000
Bauxite		—	—	—	[e]217,000	[2]700,000
Metal, unalloyed ingot		386,150	395,894	424,000	[e]428,000	[2]455,000
Gold, mine output, Au content	troy ounces	50,885	74,180	82,800	124,141	[2]118,091
Iron and steel:						
Iron ore and concentrate	thousand tons	13,371	14,754	17,396	17,780	[2]18,789
Metal:						
Pig iron	do.	326	441	491	473	[2]496
Sponge iron	do.	2,486	2,635	2,918	3,111	[2]3,157
Ferroalloys:						
Ferromanganese	do.	2	2	—	—	—
Ferrosilicomanganese	do.	9	22	29	[e]28	30
Ferrosilicon[3]	do.	44	61	51	[e]50	55
Total	**do.**	**55**	**85**	**80**	**[e]78**	**85**
Steel, crude	do.	2,777	3,055	3,467	3,722	[2]3,677
Semimanufactures, hot-rolled	do.	1,973	2,060	2,315	3,081	[2]2,994
Lead, secondary, smelter[e]		17,000	18,000	16,000	17,000	18,000
INDUSTRIAL MINERALS						
Amphybolite		169,081	183,296	315,833	241,000	[2]179,200
Cement, hydraulic		4,783,000	5,294,000	5,747,000	6,110,000	[2]6,199,000
Clays:						
Kaolin		12,540	13,906	14,906	25,598	[2]24,800
Other	thousand tons	1,868	1,928	1,648	1,794	[2]1,967
Diamond:						
Gem	carats	40,739	47,400	45,000	[e]35,000	[2]55,200
Industrial	do.	232,183	167,900	188,500	[e]63,000	[2]52,500
Total	**do.**	**272,922**	**215,300**	**233,500**	**[e]98,000**	**[2]107,700**
Feldspar		40,497	42,440	34,900	43,546	[2]96,500
Gypsum		142,386	188,754	250,230	246,324	[2]250,900
Nitrogen, N content of ammonia		[r]518,000	[r]452,000	530,000	577,000	[2]481,000
Phosphate rock		3,265	8,567	194,221	212,779	100,000
Pyrophyllite		15,500	18,700	25,000	[e]32,000	32,000
Salt, evaporated		280,700	338,889	511,421	[e]500,000	500,000
Serpentinite, crushed		345,225	517,117	553,550	[e]580,000	580,000
Stone, sand and gravel:						
Stone:						
Dolomite	thousand tons	87	274.00	271	257	[2]276
Granite		335,726	655,587	568,300	[e]287,000	[2]561,400
Limestone	thousand tons	11,561	13,906	14,907	15,458	[2]17,999
Marble	cubic meters	169	272	549	671	675

See footnotes at end of table.

TABLE 5—Continued

VENEZUELA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1984	1985	1986	1987[p]	1988[e]
INDUSTRIAL MINERALS—Continued						
Stone, sand and gravel—Continued						
Sand and gravel	thousand tons	5,989	6,879	7,030	7,645	[2]7,565
Sand, glass	do.	334	297	335	548	[2]441
Sulfur, byproduct of petroleum and natural gas[e]		86,000	35,100	99,380	[r]125,000	[2]125,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black[e]	thousand tons	51	51	41	61	60
Coal, bituminous		50,870	41,427	67,641	117,000	1,000,000
Gas, natural:						
Gross	million cubic feet	[r]1,147,925	[r]1,173,110	[r]1,291,005	[r]1,276,040	[2]1,340,280
Marketable	do.	517,664	498,159	576,390	[e]465,300	450,000
Natural gas liquids:[4]						
Natural gasoline	thousand 42-gallon barrels	4,708	6,885	6,687	[e]6,500	6,500
Liquefied petroleum gas	do.	13,945	15,849	15,007	[e]15,000	15,000
Total	**do.**	**18,653**	**22,734**	**21,694**	**[e]21,500**	**21,500**
Petroleum:						
Crude[5]	do.	658,279	613,583	664,125	664,125	[2]625,995
Refinery products: Gasoline:						
Aviation	do.	539	373	277	286	260
Motor	do.	46,100	59,994	88,470	76,884	85,000
Jet fuel	do.	14,486	18,263	20,770	21,229	20,000
Kerosene	do.	4,277	21,648	32,060	32,640	30,000
Distillate fuel oil	do.	69,744	92,870	87,470	76,884	85,000
Residual fuel oil	do.	117,466	107,987	96,620	89,760	[2]102,565
Lubricants	do.	2,340	2,343	2,453	2,566	2,000
Liquefied petroleum gas	do.	1,868	15,848	2,824	2,768	[2]3,285
Asphalt and bitumen	do.	8,930	10,215	11,980	11,983	10,000
Naphtha	do.	19,800	21,249	15,750	18,760	15,000
Refinery gas[6]	do.	12,020	7,844	9,862	7,400	8,000
Unspecified	do.	27,813	20,754	22,330	22,640	20,000
Total	**do.**	**325,383**	**379,388**	**390,866**	**363,800**	**[e]381,110**

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Aug. 18, 1989.

[2]Reported figure.

[3]Figure represents combined 45% silicon content and 75% silicon content production.

[4]From nonassociated natural gas only.

[5]Includes associated natural gas lease condensate and natural gasoline. Lease condensate is included as follows, in thousand 42-gallon barrels: 1984–39,785 (revised); 1985–43,435; 1986–51,830; 1987–60,225; and 1988–68,620. Natural gasoline is included as follows, in thousand 42-gallon barrels: 1984–20,805 (revised); 1985–22,995 (revised); 1986–35,405; 1987–34,310; and 1988–35,770.

[6]Liquid equivalent.

3-year trade agreement at yearend. Under the proposed agreement, Cuba would receive tariff preferences in export goods such as rum, tobacco, and nickel oxide among others, and Venezuela would have tariff preferences in oils, greases, lubricants, pipe connections, aluminum plates and sheets, and industrial valves.

The Mines and Energy Ministry reported that Venezuela would be able to increase its petroleum exports in 1989. Based on an increase in crude petroleum prices, the export sales would generate in excess of $9 billion. This

would exceed the 1988 export income by about $2 billion.

Mexico and Venezuela renewed the San José Agreement, initially signed in 1980, to supply petroleum to Caribbean and Central American countries. The volume sold, originally 160,000 bbl/d, now is 130,000 bbl/d. Ten countries were to receive petroleum including Nicaragua, which had been previously excluded.

Commodity Review

***Metals.*—Aluminum and Bauxite.**—In 1988, Venezuela produced an estimated 455,000 tons of unalloyed aluminum, an increase of about 6% from that of 1987. A portion of a new potline was inaugurated in midyear at VENALUM, which increased its annual capacity 50,000 tons to 330,000 tons per year. The other State-owned company, Aluminio del Caroni S.A. (ALCASA), increased its production to 127,000 tons in 1988.

Work on the 360,000-ton smelter for Aluminio Guayana (ALUYANA) in Puerto Ordaz, Bolívar State, began in October. CVG had a 51% share with two Italian companies, Cía. Técnica International (a private company) and Italimplanti (a state-owned company) sharing the remaining 49%. The first phase of the smelter, 195,000 tons per year, is to be operational in 1991 while the final phase, 175,000 tons per year, will be completed in 1993. In addition to ALUYANA, five new primary aluminum smelters were planned, all to be completed between 1991 to yearend 1993. They are as follows: ALAMSA (180,000 tons in 1991), ALISA (60,000 tons by yearend 1993), Aluminios de Angostura (190,000 tons prior to 1993), ALUQUAY (180,000 by yearend 1993), and ALUSUR (120,000 tons in 1992). In 1988, VENALUM announced plans to increase the plant's smelting capacity by 145,000 tons by 1998, while ALCASA announced plans to expand its smelting capacity by 180,000 tons by 1990. The Government announced a projected total capacity for aluminum production of 1.8 million tons by 1996. Also announced were projections of 3 million tons of alumina and 6 million tons of bauxite by 1996. Plans were made to expand Interamericana de Alumina C.A.'s (INTERALUMINA) alumina capacity from 1 million to 2 million tons per year by 1996. INTERALUMINA exceeded its designed capacity by 30% in 1988 as it produced 1.3 million tons of alumina.

In 1987, the first year that C.V.G Bauxita Venezolana C.A.'s (BAUXIVEN) Los Pijiguaos Mine was in operation, 217,000 tons of bauxite was produced. In 1988, the mine's production rose to an estimated 700,000 tons. In the coming decade, rapid expansion in production had been planned to complement corresponding growth in aluminum and alumina over this period. With its proven reserves assessed at over 200 million tons of aluminum, planned production was to reach 1.6 million tons in 1990 and 8 million tons by 1995.

In the past, bauxite for the aluminum industry was obtained primarily from foreign sources. By contrast, indigenous reserves are expected to become the major source of bauxite by the mid-1990's. Savings to the alumina industry have been projected to be $150 million, or 13% of current production costs, compared with the present import policy.

Gold.—After successive gold production increases from 1984–87, production decreased by 5% in 1988 to 118,100 troy ounces. CVG reported that new plans were under way to place Venezuela among the top gold producers in the world. The President of CVG had envisaged the exporting of up to 250 tons of gold per year by the year 2000. Surveys have suggested that the Guayana region south of the Orinoco River could contain 10,000 tons of gold. In addition, CVG claimed that the El Callao region, about 800 kilometers southeast of Caracas, contains 8,000 tons of proven reserves, 5,000 tons of which were extractable by open pit operations. CVG's mineral exploration subsidiary, Técnicos Mineros (TECMIN) had carried out studies revealing that Venezuela may possess anywhere from 5% to 10% of the world's gold reserves.

Steps were taken in the southern Guayana region to reduce the amount of gold being smuggled out of the country. The measures taken included setting aside areas for small-scale mining, authorizing the central bank to buy gold from miners at world daily prices, and giving the industry a $2 million income tax allowance.

At yearend, Promiven Mining Co., a Spanish-Venezuelan venture, and Vencemos, a private mining group in Venezuela, reported plans to start up an alluvial gold mine located in the southern part of Venezuela. They also secured four adjacent concessions. Detailed exploration, mine planning, and development were expected to be completed by June 1989, with production to begin shortly thereafter. Promiven also signed a joint-venture agreement with CVG founding a company called PMG, which will develop several large areas in the Bochinche and Chocó areas (El Callao gold district) in northeast Bolívar State.

Iron Ore.—Venezuela's iron ore production rose to 18.8 million tons in 1988, which was almost a 6% increase from that of 1987. The Piar Div.'s San Isidro and Cerro Bolívar Mines collectively produced approximately 87% of the total while Pao's El Pao Mine produced the remainder. The San Isidro Mine produced 58% of the Piar division's total for 1988.

FERROMINERA had planned increased production in the San Isidro and Cerro Bolívar Mines and the start-up of the Los Barrancos Mine, adjacent to San Isidro, to more then compensate for the total depletion of the El Pao Mine by 1993.

FERROMINERA had drawn up plans to increase its mining and export capacity

and to boost productivity. The main goals were: an increase in production of the Piar Div. to 25 million tons per year by 1992; construction of a pelletization plant with a capacity of 3.3 million tons; a floating transshipment station on the Orinoco River to allow loading onto bulk carriers of up to 200,000 deadweight tons; and to increase productivity to 3 tons per employee.

Venezuela continued to look toward Japan as a vital source of foreign capital for investment in mining projects and as a valuable export destination. Iron ore exports to Japan were begun in 1986. In 1988, exports totaled approximately 800,000 tons with plans for 2 million tons for 1989. China, the Republic of Korea, and other Asian countries have been targeted as possible export outlets.

Japan's Kobe Steel Ltd. was to invest $12 million in the rehabilitation of the Minerales Ordaz C.A. (MINORCA) direct-reduction iron briquet plant at Puerto Ordaz, Bolívar State.

Iron and Steel.—Steel production decreased by slightly more than 1% to 3.7 million tons in 1988 while manufactured steel production decreased slightly to 3 million tons. Pig and sponge iron recorded small increases in 1988 production.

Feasibility studies were completed at yearend on a new slab steel project, Complejo Siderúrgico de Guayana (COMSIGUA). The project, involving Venezuela's CVG and Japan's Kobe Steel, was expected to have a 950,000-ton-per-year slab capacity.

C.V.G. Siderúrgica del Orinoco C.A. (SIDOR) announced plans to expand its seamless steel tube plant in 3 stages to a total capacity of 335,000 tons per year.

Other Metals.—Production of ferroalloys was approximately near the level for 1987. C.V.G. Ferrosilicón de Venezolana C.A. (FESILVEN) announced plans for expansion and modernization of its facilities. The plans included construction of two additional furnaces, increased capacity of ferrosilicon 75% by 25,000 tons per year, and increased capacity of 13,500 tons per year of silicon metal.

Strategic Minerals Corp. (STRATCOR) of the United States announced an agreement with Procesadora Paraguana C.A. (PROPACA) whereby the Venezuelan company would provide 25% to 30% of the feed to STATCOR's vanadium processing plant in Hot Springs, Arkansas, United States. PROPACA was to begin operations in early 1989. PROPACA, which was founded in 1986, will process all of the vanadium-bearing petroleum coke produced by LAGOVEN S.A., a subsidiary of PDVSA.

***Industrial Minerals.*—Cement.**—In 1988, total cement production was 6.2 million tons, which was 93% of the total capacity. The largest company, Venezolana de Cementos C.A. (VENCEMOS), produced approximately 50% of the total production. Cementos Caribe, one of two cement producers in Venezuela that export cement, produced 900,000 tons in 1988 of which about 405,000 tons was exported.

Other Industrial Minerals.—PEQUIVEN announced an agreement with Norsk Hydro of Norway to build an ammonia plant in José, near Puerto La Cruz in eastern Venezuela. The $207 million project will include a 500,000 tons per year liquid ammonia plant. PEQUIVEN holds a majority 49% stake in the venture, Norsk Hydro a 30% share, national investors a 15% share, and 6% is offered on the Caracas stock exchange.

***Mineral Fuels.*—Coal.**—Venezuela's coal production increased from about 117,000 tons in 1987 to an estimated 1 million tons in 1988. Total production has been planned to reach 6.5 million tons per year at a cost of $550 million by 1996. Coal exports totaled 773,000 tons in 1988. Europe received 74% of the exports, the United States received 21%, and the Caribbean region 5%.

In 1988, there were three major coal projects in various stages of development. The Tachira project, having proven reserves of 375 million tons of coking coal when fully developed, will produce 320,000 tons per year for shipment downriver to Ciudad Guayana for use by the aluminum and steel industries there. The Fila Maestra project in Anzoategui State, a joint Spanish-Venezuelan venture begun in 1982, was in the process of increasing its production of steam coal from 300,000 tons to 700,000 tons over the next 5 years. Carbones del Zulia C.A. (CARBOZULIA) reported production of about 500,000 tons from the Paso Diablo project in 1988.

CARBOZULIA was reported to have abandoned the idea for the development of a new deepwater port near Paraguaipoa, Zulia State, because of the high cost and has tentatively chosen to expand the existing facilities at Santa Cruc de Mara north of Maracaibo City.

Natural Gas and Petroleum.—Crude petroleum production decreased by about 4% to an estimated 637 million barrels in 1988. Venezuela came under criticism by the Organization of Petroleum Exporting Countries (OPEC) for excluding condensate and natural gas liquids from its total natural gas and petroleum production figures. In addition, a controversy was developing with some members of OPEC over the marketing of "orimulsion," a mixture of extra heavy crude petroleum and water that can be burned like coal or fuel oil.

CORPOVEN S.A., a subsidiary of PDVSA, found a very productive crude petroleum-bearing zone at a depth of 5,182 meters on the El Furrial trend. This Oligocene age strike was north of the Musipan and El Carito oil and gas strikes in northern Monagas State. The El Furrial find had added 6 billion barrels of light and medium crude petroleum to the existing 58 billion barrels of proven reserves and added 21 trillion feet of natural gas to the existing 102 trillion

feet of proven reserves. In 1988, PDVSA became the first wholly state-owned company to become sole owner of a major United States refinery. It purchased the remaining 50% of Champlin Refining Co. from the parent company, Union Pacific Corp. The primary asset was the 160,000-bbl/d refinery in Corpus Christi, Texas. In addition, Venezuela Petroleum Holdings Inc., a United States subsidiary of PDVSA, was negotiating with Unocal Corp. over formation of a partnership and the transfer of Unocal's Chicago, Illinois, refinery along with certain marketing and other assets to the partnership.

Two United States banks, Bank America Corp. and Salomón Bros., agreed to lend $1 billion against future crude petroleum sales to the two United States refineries in which Venezuela holds a stake. The agreement essentially amounted to the immediate availability of cash in exchange for accounts receivable for the sale of 300,000 to 325,000 bbl/d of crude petroleum. The proceeds were to be drawn in December by the Venezuelan Central Bank to help make interest payments on the foreign debt. Repayment was structured so that the loan would be repaid by 1995.

CORPOVEN, operator of the Eastern Venezuela Cryogenic Complex in Anzoategui State, began preliminary engineering studies for a 50% increase of its design capacity of 800 million cubic feet per day. The plan was pushed by PDVSA in order to find new ways to utilize abundant natural gas supplies.

PEQUIVEN and Ecofuel, a subsidiary of Italy's national hydrocarbon company Ente Nazionale Idrocarburi, signed an agreement to form a joint petrochemical venture. The new company, Super Octanos C.A., will produce 500,000 tons per year, of a nonlead additive that raises the gasoline octane level. Each company will hold 49% of the new firm's shares with the remaining 2% being sold to private Venezuelan investors. The project's cost was projected to be $145 million with the start up scheduled for late 1989.

[1] By Orlando Martino, physical scientist, Division of International Minerals.

[2] By Jerome F. Machamer, economic geologist, Division of International Minerals.

[3] Where necessary, values have been converted from Colombian pesos (Col $) to U.S. dollars at the rate of Col$340 = US$1.00.

[4] By Alfredo C. Gurmendi, physical scientist, Division of International Minerals.

[5] By Alfredo C. Gurmendi, physical scientist, Division of International Minerals.

[6] By Alfredo C. Gurmendi, physical scientist, Division of International Minerals.

[7] Where necessary, values have been converted from Suriname guilder (SG) to U.S. dollars at the official rate of SG1.77 = US$1.00.

[8] By H. Robert Ensminger, physical scientist, Division of International Minerals.

[9] Unless otherwise specified, values have been converted from Venezuelan bolivars (Bs) to U.S. dollars at the rate of Bs14.50 = US$1.00.

TABLE 6

FRENCH GUIANA: EXPORTS AND REEXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Destinations, 1987	
				United States	Other (principal)
Iron and steel: Metal:					
Scrap		31	6	—	All to Brazil.
Semimanufactures:					
Bars, rods, angles, shapes, sections		—	10	—	All to Suriname.
Universals, plates, sheets		3	—		
Molybdenum: Metal including alloys, all forms		—	2	—	All to Martinique.
Petroleum refinery products:					
Gasoline	42-gallon barrels	4,692	—		
Distillate fuel oil	do.	6,901	358	NA	NA.
Residual fuel oil	do.	5,501	—		
Salt and brine		—	1	—	All to Guadeloupe.
Stone, sand and gravel: Gravel and crushed rock		—	2	—	All to France.

NA Not available

[1] Table prepared by H. D. Willis.

TABLE 7

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1	2	—	All from France.
Metal including alloys, semimanufactures	52	81	10	France 60; West Germany 10.
Chromium: Oxides and hydroxides value, thousands	—	$1	—	All from France.
Cobalt: Oxides and hydroxides do.	—	$3	—	Do.
Copper: Metal including alloys, semimanufactures	57	64	(2)	Mainly from France.
Iron and steel: Metal:				
Scrap value, thousands	$1	—		
Ferroalloys	3	—		
Steel, primary forms	—	8	—	Mainly from West Germany.
Semimanufactures:				
Bars, rods, angles, shapes, sections	3,747	3,708	1	France 2,658; Belgium-Luxembourg 297; Spain 244.
Universals, plates, sheets	2,498	2,918	—	France 2,599; Martinique 173; Belgium-Luxembourg 142.
Hoop and strip	2	4	—	All from France.
Rails and accessories	4	NA		
Wire	26	43	—	France 40; Netherlands 2; Italy 1.
Tubes, pipes, fittings	955	950	1	France 783; Spain 120; Belgium-Luxembourg 25.
Castings and forgings, rough	38	43	—	France 37; West Germany 6.
Lead:				
Oxides value, thousands	$1	$1	—	All from France.
Metal including alloys, semimanufactures	2	2	—	Do.
Mercury do.	$6	$8	—	France $7; West Germany $1.
Nickel: Metal including alloys, semimanufactures	—	1	—	All from France.
Tin: Metal including alloys, semimanufactures value, thousands	$2	$5	—	Do.
Titanium: Oxides	2	1	—	Do.
Zinc: Metal including alloys, semimanufactures	1	—		
Other:				
Ashes and residues	41	202	—	Do.
Base metals including alloys, all forms value, thousands	$4	$2	—	Do.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	31	—		
Grinding and polishing wheels and stones	9	9	—	France 5; Italy 3.
Boron materials: Oxides and acids	1	—		

See footnotes at end of table.

TABLE 7—Continued

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Cement	42,816	47,950	—	France 15,275; Martinique 11,511; Guadeloupe 6,936.
Chalk	11	—		
Clays, crude	7	20	—	All from France.
Diamond, natural:				
Gem, not set or strung value, thousands	$13	$13	—	Do.
Industrial stones do.	—	$4	—	Do.
Diatomite and other infusorial earth	—	1	—	Do.
Fertilizer materials:				
Crude, n.e.s.	1	1	—	Do.
Manufactured:				
Ammonia	4	5	—	Mainly from France.
Nitrogenous	749	882	—	France 500; Netherlands 370; Belgium-Luxembourg 12.
Phosphatic	144	228	—	Belgium-Luxembourg 165; France 63.
Potassic	102	68	—	France 64; Belgium-Luxembourg 4.
Unspecified and mixed	1,160	994	80	France 818; Belgium-Luxembourg 89.
Gypsum and plaster	50	108	—	All from France.
Lime	557	238	—	France 138; Martinique 100.
Mica: Worked including agglomerated splittings	7	—		
Pigments, mineral: Iron oxides and hydroxides, processed value, thousands	—	$1	—	All from France.
Precious and semiprecious stones other than diamond:				
Natural do.	$85	$39	$1	Brazil $35; France $3.
Synthetic do.	—	$1	—	All from France.
Salt and brine	376	429	—	France 189; West Germany 170; Spain 59.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1	(2)	—	All from France.
Sulfate, manufactured	107	203	—	Do.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	260	21	—	All from Italy.
Worked	34	49	(2)	Italy 21; France 20; Brazil 7.
Dolomite, chiefly refractory-grade	58	124	—	France 104; Belgium-Luxembourg 20.
Gravel and crushed rock	13	—		
Quartz and quartzite	NA	2	—	All from West Germany.
Sand other than metal-bearing	195	114	20	France 74; Canada 15.

See footnotes at end of table.

TABLE 7—Continued

FRENCH GUIANA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Sources, 1987	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Sulfur:					
Elemental, crude including native and byproduct		1	18	—	All from France.
Sulfuric acid		5	15	—	France 10; Guadeloupe 5.
Other:					
Crude		69	98	—	France 93; West Germany 5.
Slag and dross, not metal-bearing		—	42	—	All from France.
MINERAL FUELS AND RELATED MATERIALS					
Coal excluding briquets		23	—		
Coke and semicoke	value, thousands	—	$1	—	All from Martinique.
Peat including briquets and litter		20	9	—	All from France.
Petroleum refinery products:					
Liquefied petroleum gas	42-gallon barrels	21,425	32,062	—	Trinidad and Tobago 29,476; Netherlands Antilles 2,216; France 360.
Gasoline, motor	do.	147,586	229,475	—	Trinidad and Tobago 228,880; France 595.
Mineral jelly and wax	do.	8	346	—	All from France.
Kerosene and jet fuel	do.	90,001	106,772	—	Mainly from Trinidad and Tobago.
Distillate fuel oil	do.	300,548	315,305	3,529	Trinidad and Tobago 301,004; Netherlands Antilles 7,102; Venezuela 3,670.
Lubricants	do.	8,477	13,489	7	France 9,569; Belgium-Luxembourg 2,891; Jamaica 581.
Residual fuel oil	do.	124,509	232,414	—	All from Trinidad and Tobago.
Bitumen and other residues	do.	14,502	11,399	—	Trinidad and Tobago 11,326; France 73.
Bituminous mixtures	do.	18	36	—	All from France.

NA Not available.

[1] Table prepared by H. D. Willis.

[2] Less than 1/2 unit.